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# (54) UV sterilization apparatus

(57) A water sterilisation system using ultraviolet lamps for sterilisation purposes in which, in a water flow path, a pair of ultraviolet lamps is used each at half the required sterilisation power. If one lamp fails the other automatically switches to provide the necessary power for complete sterilisation or disinfection. An alarm is given upon lamp failure.

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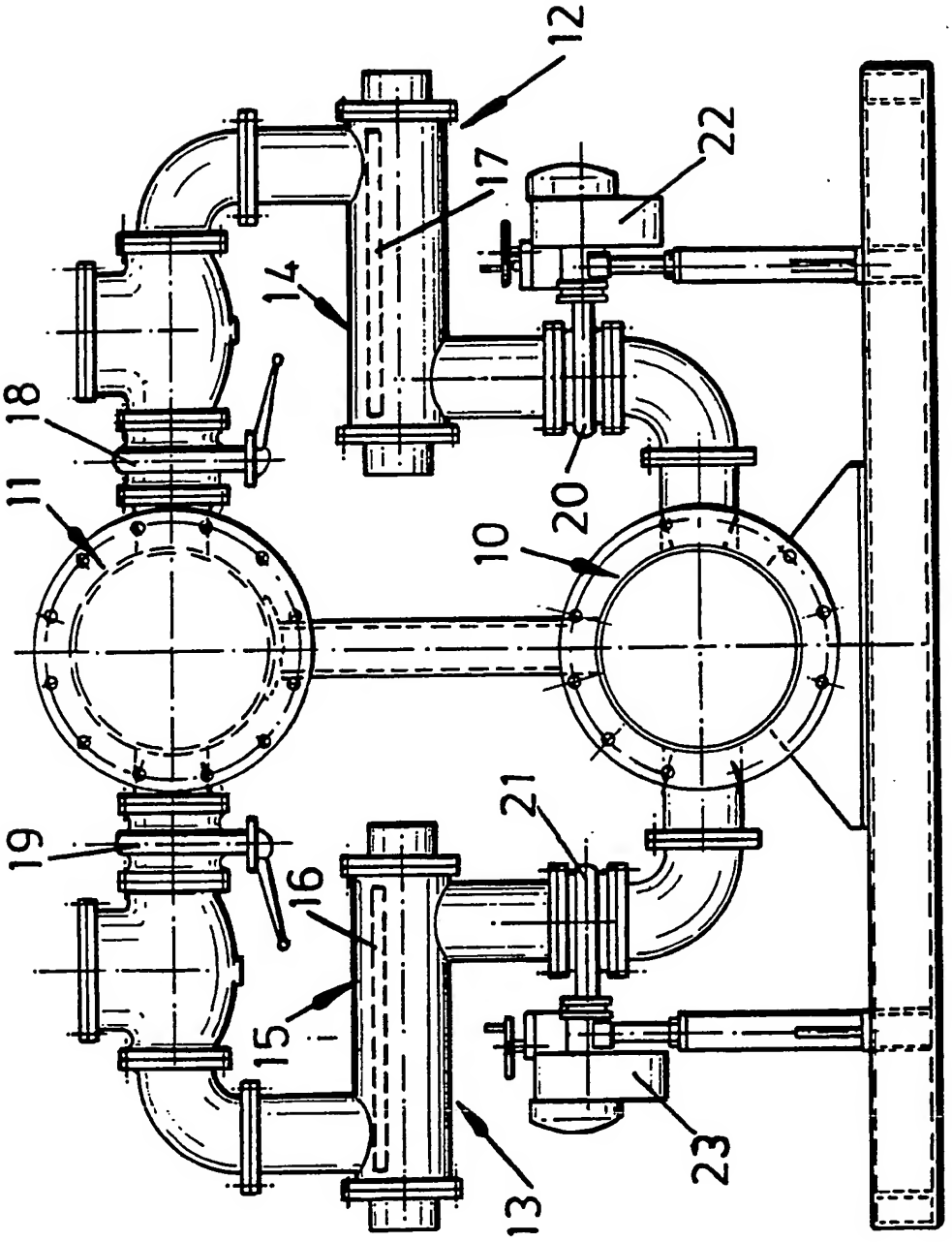
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# WATER STERILISATION CONTROL SYSTEMS

This invention relates to a water sterilisation control system.

It is well known that water is sterilised or disinfected by causing it to flow past ultraviolet lamps in series or parallel flow paths and it is an object of the present invention to provide a control system which provides power savings and, when required in a parallel flow arrangement, immediate full flow changeover compared with existing control systems.

According to the present invention there is provided a water sterilisation control system comprising a reactor defining a flow path through which water to be sterilised is passed there being within, or otherwise operatively associated with, this flow path a plurality of ultraviolet lamps adapted to operate at a power level determined by the quantity of water passing along the flow path and necessary to provide complete sterilisation or disinfection of the water flowing therethrough, the arrangement being such that if an ultraviolet lamp fails another, or others, immediately switches to a greater power level thereby ensuring continued complete sterilisation of the water.

Preferably, there is a pair of ultraviolet lamps within the flow path each adapted to operate at half the power level necessary to provide the necessary water sterilisation or disinfection commensurate with the quantity of water passing along the flow path.

In one example, assuming maximum quantity of water flowing along the flow path, each ultraviolet lamp operates at half its total power level, the arrangement being such that failure of one of the ultraviolet lamps causes the other to be switched to its full total power level.

There may be more than two ultraviolet lamps in a water flow path, all of the lamps, or a lesser number upon lamp failure, providing the necessary ultraviolet power level to provide the necessary complete sterilisation or disinfection.

Preferably, in the event of failure of an ultraviolet lamp, an alarm signal (audible and/or visual) is operated to ensure that corrective or maintenance action can be taken.

Water sterilisation systems can either be run in series or in

parallel, i.e. the water runs through a series of pipes defining a single flow path or the water flow is split to follow two or more parallel paths and the control system of the present invention is applicable to either the series or parallel arrangements.

In the case of a parallel flow system reactor with an equal quantity of water flowing along each flow path thereof and with an ultraviolet lamp operating therein, failure of one ultraviolet lamp causes shutdown of the respective flow path, diversion of the total water flow into the other path (or equally into the other flow paths if the reactor has more than two flow paths), and the necessary increase in the power level of the other (or each other) ultraviolet lamp to ensure the necessary complete sterilisation or disinfection of the water.

It is preferred that parallel flow systems be employed since these allow for quartz sleeve cleaning or replacement without the whole water flow system being rendered inoperative.

As a result of the present invention passage of untreated water upon lamp failure is avoided, and, in the case of parallel water flow paths, sealing of one (or more) thereof upon lamp failure is avoided.

An example of the present invention is illustrated in the accompanying drawing which is an end view of a parallel water sterilisation system incorporating the present invention.

The drawing shows a water sterilisation, parallel flow path reactor with a lower header water supply 10 and an upper header water supply 11 with a right hand water flow path 12 and a left hand water flow path 13 each of which incorporates an ultraviolet sterilisation region 14 and 15 respectively each of which incorporates an ultraviolet quartz lamp 16 and 17 respectively.

Each water flow path 13 and 14 incorporates manually operable valves 18 and 19 respectively and power operated valves 20 and 21 respectively the valve actuators being indicated by the references 22 and 23.

The essence of the present invention is that the ultraviolet quartz lamps 16 and 17 are each operated at a power level necessary to effect complete sterilisation or disinfection of the quantity of water flowing through the respective flow paths.

The ultraviolet lamps 16 and 17 are controlled so if for any reason one of the lamps 16 or 17 fails the valve 20 or 21 automatically closes with diversion of all water flow along flow path 13 or 14 and the power level of ultraviolet lamp 16 or 17 automatically increased to provide the necessary complete sterilisation or disinfection.

Under normal circumstances with full capacity water flow along paths 13 and 14 each lamp 16 and 17 operates at half its normal power level.

If the water capacity along each flow path is less than full then the power level of each lamp is correspondingly reduced.

Failure of one lamp doubles the operational power level of the remaining lamp automatically.

In the case of a series flow system the same circumstances apply but without any shutdown or water flow diversion.

The ultraviolet lamp control system includes an alarm signal which indicates to an operator, visually and/or audibly, that there has been a lamp failure.

The water sterilisation system according to the present invention can be applied to single running and single stand-by reactors. If it is so applied then 100% stand-by is provided. However, it is envisaged that it could be applied to give 50% stand-by where three reactors would be run at 66% power and when one goes down the remaining two would be switched upto 100% and so on to 25% stand-by which would be the most usual arrangement with multi-reactor installations.

In a water sterilisation system having ten reactors it would be normal to run eight of the reactors with two of the reactors (25% of the reactors) as stand-by. With this system run normally the power requirement would be eight times x 5kw for example equalling 40kw to give complete sterilisation.

In accordance with the water sterilisation system according to the present invention the ten reactors would be run at 4kw giving a 40kw output and when one of the reactors goes down then the remaining nine reactors would be raised insofar as the power requirement is concerned to 4.5kw giving a similar total of 9 x 4.5kw = 40.5kw. On replacing the faulty lamp in the "down" reactor and starting up the other reactors would respond by levelling down to the

original 4kw output per reactor.

The signal indicating quartz lamp failure or fault would be indicated by loss of energy across the lamp system since the conventional monitoring systems used in water sterilisation plants cannot be reasonably set for varying stepped lamp output.

CLAIMS

1. A water sterilisation system comprising a reactor defining a flow path through which water to be sterilised is passed there being within, or otherwise operatively associated with, this flow path a plurality of ultraviolet lamps adapted to operate at a power level determined by the quantity of water passing along the flow path and necessary to provide complete sterilisation or disinfection of the water flowing therethrough, the arrangement being such that if an ultraviolet lamp fails another, or others, immediately switches to a greater power level thereby ensuring continued complete sterilisation of the water.

2. A water sterilisation system as claimed in claim 1, in which there is a pair of ultraviolet lamps within the flow path each adapted manually to operate at half the power level necessary to provide the necessary water sterilisation or disinfection commensurate with the quantity of water passing along the flow path.

3. A water sterilisation system as claimed in claim 1 or 2, in which, assuming maximum quantity of water flowing along the flow path, each ultraviolet lamp operates at half its total power level, the arrangement being such that failure of one of the ultraviolet lamps causes the other to be switched to its full total power level.

4. A water sterilisation system as claimed in claim 1 or 2, in which there are more than two ultraviolet lamps in a water flow path, all of the lamps, or a lesser number thereof upon lamp failure, providing the necessary ultraviolet power level to provide the necessary complete sterilisation or disinfection.

5. A water sterilisation system as claimed in any one of claims 1 to 4 comprising an alarm signal (audible and/or visual) adapted to be operated upon a lamp failure to ensure that corrective or maintenance action can be taken.

6. A water sterilisation system as claimed in any one of claims 1 to 5 comprising a series-arranged water flow path.

7. A water sterilisation system as claimed in any one of claims 1 to 5 comprising a parallel-arranged water flow path.

8. A water sterilisation system, substantially as hereinbefore

described with reference to the accompanying drawing.

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